Pediatric Emergency Medicine Simulation Course: Hypovolemic Shock

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1. Instructor Contact Information

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2. Description of Case

Case Overview
This case teaches learners to recognize and manage pediatric hypovolemic shock.

The case is simulation-based with an integrated team communication focus.

Learners will participate in a simulation scenario and be asked to identify the signs and symptoms of hypovolemic shock and its management (See Appendix A).

At the end of training, the learners should be able to recognize the seriousness of the situation and recruit a full resuscitation team. The primary complication for the team to recognize and manage is hypotension with inadequate perfusion.

Educational Rationale on How the Case Generalizes to Real-Life Circumstances
Hypovolemic shock continues to be a major cause of death worldwide. Hypovolemic shock is characterized by inadequate tissue perfusion from decreased intravascular volume from fluid loss and/or inadequate fluid intake, such as with vomiting and diarrheal illnesses or hemorrhage.

Medical providers must recognize children in hypovolemic shock early when they are more likely to respond favorably to treatment. Medical providers must initiate fluid resuscitation rapidly with appropriate fluids to prevent further decompensation and cardiovascular collapse.

The goal of this case is to provide the learner with an opportunity to manage life threatening pediatric hypovolemic shock, where the correct steps need to be taken in a limited period of time.

Key elements include the primary survey, eliciting critical history (inadequate fluid intake and increased losses), recognizing the need to call for team assistance early in an event, recognizing hypovolemic shock (tachycardia, hypotension, diminished pulses, delayed capillary refill, altered mental status) and treating hypovolemic shock (rapid isotonic crystalloid administration).

Duration of Training Session: 1 hour
Frequency of Case: 2-4 times per year
Number of Trainees per Session: 3 to 7

General Notes:
This case is part of larger pediatric emergency medicine curriculum that Seattle Children’s Hospital has run over the course of approximately 6 months. It is offered to our residents, during different ongoing educational opportunities, 4 times over their academic year. In general, this scenario and the curriculum have been well received over the past 3 years. It was implemented as a research project and requested by the residents to continue as an ongoing “educational staple”. The larger curriculum has been continuously repeating for about three and a half years. The scenario and supporting materials you are reviewing are the results of iterative changes to our original scenario, based on learner feedback we have received over the past three years.
### 3. Target Trainees

**Primary:** Pediatric and emergency medicine residents, fellows, faculty and nurses  
**Secondary:** N/A
4. Prerequisite Knowledge and Skills

*Required background knowledge:*

- Signs and symptoms of hypovolemic shock
- Anatomy related to placement of an intraosseous line in the tibia
- Knowledge of isotonic crystalloid vs. colloid fluids
- TeamSTEPPS communication terminology (See Appendix B)

*Required background skills expected in trainees prior to receiving training in the target training:*

- Assessment of breathing and circulation
- How to provide supplemental oxygen
- How to insert an intraosseous line
- How to provide rapid administration of isotonic crystalloid fluids
Goal 1: Recognition of Hypovolemic Shock
The learner will demonstrate recognition of hypovolemic shock in a safe and professional manner. (ACGME Competencies: Medical Knowledge\(^1\), Patient Care\(^2\), Interpersonal and Communication Skills\(^3\), Professionalism\(^4\), System-based Practice\(^5\), Technical skills\(^6\))

**Objective 1a - Initial patient assessment** \(^{[1, 2, 3, 4]}\)
The learner will be expected to discuss what s/he would look for in an initial physical examination (primary survey e.g. airway, breathing, circulation, disability, exposure) and history (SAMPLE- Signs and symptoms, Allergies, Medications, Past medical history, Last meal, and Events) of any pediatric patient s/he is evaluating.

**Objective 1b– Appropriate monitoring** \(^{[1, 2, 3]}\)
The learner should apply basic monitoring standards for a patient in shock (cardiorespiratory monitors, pulse oximetry, blood pressure, and temperature). S/he should obtain a patient weight or an objective estimate (e.g. Broselow-Luten Tape).

**Objective 1c - Identification of hypovolemic shock** \(^{[1, 2, 3]}\)
The learner should identify signs of hypovolemic shock in history (poor fluid intake, excessive fluid losses) and in physical exam (tachycardia, hypotension, diminished pulses, delayed capillary refill, altered mental status).

**Objective 1d- Distinguish between compensated and uncompensated hypovolemic shock** \(^{[1, 2, 3]}\)
The learner should distinguish between compensated hypovolemic shock (tachycardia, delayed capillary refill) and uncompensated hypovolemic shock (hypotension, altered mental status).

Goal 2: Management of Hypovolemic Shock
The learner will treat hypovolemic shock in a safe and professional manner. (ACGME Competencies: Medical Knowledge\(^1\), Patient Care\(^2\), Interpersonal and Communication Skills\(^3\), Professionalism\(^4\), System-based Practice, \(^5\) Technical skills\(^6\))

**Objective 2a - Management of hypovolemic shock with supplemental oxygen** \(^{[1, 2]}\)
The learner should apply supplemental oxygen using face mask. Goal is to improve oxygen delivery to tissues.

**Objective 2b - Management of hypovolemic shock with isotonic crystalloid fluids** \(^{[1, 2]}\)
The learner should obtain intravenous (IV) or intraosseous (IO) access within 2 min of start of scenario. Goal is to reduce perfusion abnormalities with rapid administration of isotonic crystalloid: isotonic crystalloid bolus 20 mL/kg, over 5-20 min. Boluses should be repeated until normal blood pressure and perfusion are restored.

**Objective 2c - Equipment setup** \(^{[1, 2, 3, 6]}\)
The learner should be able to set up the equipment required to treat a patient in hypovolemic shock: supplemental oxygen, intravenous or intraosseous access equipment, and equipment to achieve rapid bolus delivery (e.g. three way stopcock with 60 mL syringe or pressure bag).

**Objective 2d - Demonstrate understanding of the relevant anatomy** \(^{[1]}\)
5. Goals and Objectives

The learner should be able to identify pediatric anatomy necessary for intravenous or intraosseous access.

**Objective 2e - Technical skills** [6]
The learner should position the patient for intravenous or intraosseous access. Using appropriate clean/sterile technique, the learner should insert either an intravenous or intraosseous line and administer isotonic crystalloid fluids, rapidly.

**Goal 3: Teamwork and Communication Skills**
The learner will become more skilled in the management and leadership of emergency personnel including physicians, nurses, and ancillary personnel. (Competencies: Interpersonal and Communication Skills³, Professionalism⁴, System-based Practice⁵, Technical skills⁶)

**Objective 3a – Team structure and leadership** [3, 4, 5, 6]
The learner will be exposed to a full-scale high-fidelity simulation using a human patient simulator in which the learners are faced with a life threatening emergency due to hypovolemic shock. Clearly identify (verbally or with visual cues) and maintain a team leader (orders, priorities verbally stated by team leader) and team member roles (questions, information directed to team leader).

**Objective 3b – Communication skills** [3, 4, 5, 6]
The learner will be required to direct available resources to manage hypovolemic shock. The team will be expected to *brief* at the beginning of the scenario, *huddle* during the scenario and *debrief* after the scenario. S/he will coordinate, direct and communicate with a resuscitation team using directed call-out and check-back.
6. Instructor Notes

a. Environmental Set Up (See Section 10)
   • Try to re-create the location, look, and feel of the participants’ work environment.
   • Place simulator in a gown, diaper, etc. in order to maximize realism.

b. Pre-Simulation Introduction
   • Share a “learning contract” with participants (e.g. “We believe each of you is intelligent, well-trained, is doing their best” (adapted from the Center for Medical Simulation, Cambridge, MA)).
   • Share ground rules with participants (e.g. “Treat others with respect, maintain confidentiality”).
   • Share the agenda (e.g. “We will begin with a 15 min simulation followed by a 30 min brief”). (Instructor note: consider re-running the scenario after first brief to allow promote team implementation of their learnings. If you chose to do this, adjust your timing to allow for a short “rerun” of the scenario and short brief of the second scenario).
   • Orient your participants (e.g. Review capabilities of simulator being used. Review location/availability of equipment/supplies. Identify facilitator to whom requests/questions should be directed during the simulation).
   • Review safety issues (e.g. correct use of defibrillator).
   • Review principles of teamwork and communication – TeamSTEPPS (See Appendix B). Review expectations of team leaders and members: take time to plan before a patient arrives (brief) and “get the team on the same page” (huddle).

c. Scenario Notes
   • A “trigger” is a critical time or event that signifies the start or end of an act in the scenario. These are the critical steps that help the scenario progress. Please review these prior to conducting your session.

d. Debriefing (See Appendix C)
   • Remember: Try to have participants step away from the simulator, into a different space (e.g. chairs in a circle or separate room). This physical cue helps participants shift from “doing” - a clinical focus to “reflecting” - a learning focus.
   • Remind participants that the debriefing time is intended to focus on the group’s performance.
Common Errors and Prevention Strategies:

a. Failure to recognize hypovolemic shock.
   **Strategy:** Review signs of hypovolemic shock: tachycardia, hypotension, diminished pulses, delayed capillary refill, cool/dusky/pale skin/extremities and altered mental status.

b. Failure to treat hypovolemic shock.
   **Strategy:** Review treatment for hypovolemic shock- oxygen and isotonic crystalloid fluids.

c. Failure to provide supplemental oxygen.
   **Strategy:** Review goal of supplemental oxygen: to improve oxygen delivery and meet metabolic demand, preventing progression to cardiac arrest. This is not dependent on measured oxygen saturation. Review equipment available for oxygen administration.

d. Failure to achieve timely intravenous or intraosseous access.
   **Strategy:** Review anatomy, equipment and process for insertion of IV/IO. Review goal to achieve IV/IO access within 90 seconds for cardiopulmonary arrest.

e. Failure to rapidly administer intravenous or intraosseous isotonic crystalloid fluids.
   **Strategy:** Review goal of administration of isotonic crystalloid fluids, 20 mL/kg boluses over 5-20 min until blood pressure is restored and tissue perfusion improved. Review equipment available to achieve this.

f. Inefficient teamwork
   **Strategy:** Review need to brief (discuss team roles) prior to a critical situation and huddle (ad-hoc planning to re-establish situation awareness) during a crisis.

g. Inefficient communication: lack of call-out
   **Strategy:** Review importance of directed communication:
   “Survey physician- What’s the airway status?”

h. Inefficient communication: lack of check-back
   **Strategy:** Review use of closed-loop communication:
   Team Leader: “Give Normal saline, 200mL, IV push over 10 min”.
   Medication Preparation Nurse: “Normal saline, 200 mL, IV push over 10 min”.
   Team Leader: “Correct”.

i. Inefficient communication: lack of closed loop communication
   **Strategy:** Review use of closed loop communication
   After completion of normal saline bolus as ordered above
   Medication Administration Nurse: “Normal saline, 200mL, IV complete”
7. Common Errors and Prevention Strategies

General strategies to solve the problems

- Increase knowledge base: assigned reading, lectures, teamwork and communication training
- Debriefing focused to re-evaluate critical thinking and structure planning of actions
- Teaching points based on errors
- Regular simulation training to avoid previous mistakes
8. Cognitive Training

Key methods for delivering cognitive training include the following:

- Hypovolemic shock Learner Handout (See Appendix D).
Skills Training Scenario:

Patient
Age: 6 Months  Weight: 8 kg  Gender: Female

Scenario: The nurse asks you to see an ill-appearing child. The patient is severely dehydrated initially in compensated shock. Anticipated interventions include primary assessment and attempted IV access which will be unsuccessful. The patient develops uncompensated hypovolemic shock. Anticipated interventions include supplemental oxygen, IO placement and IO fluid rehydration with isotonic crystalloids. The patient improves with fluid rehydration.

Medical Management Learning Objectives:
1. Recognize Hypovolemic Shock
   a. Tachycardia, hypotension, weak pulses, delayed capillary refill
   b. Listlessness/lethargy, dry mucous membranes
   c. Altered mental status
2. Differentiate between compensated vs. uncompensated
3. Manage Hypovolemic Shock
   a. Oxygen 100%
   b. Rapid IV/IO fluid resuscitation
   c. Appropriate IV/IO fluids
   d. Consider differential diagnosis of hypovolemic shock/contributing factors
4. Core resuscitation skills
   a. Assessing circulatory status
   b. Demonstrate IO placement

Teamwork and Communication Objectives:
1. Team structure
   a. Identify clear leadership and roles
2. Communication skills
   a. Recruit resources
   b. Brief prior to scenario, huddle during scenario, debrief after
   c. Use directed call out
   d. Use checkback

Prelude (0-2 min):
ED: The nurse asks you to see Claire, an ill-appearing 6 month old girl. She has had 3 days of vomiting and diarrhea.

Facilitator Notes:
Give team intro outside the simulation area. Patient is initially clothed, not on monitors.

PMH: (If asked): 3 day history of non-bloody and non-bilious vomiting (15 times/day) and non-bloody diarrhea (10 times/day). Vomits within 10 minutes all feeds today. Last known wet diaper yesterday. No fever. Previously healthy. No travel, no ill contacts. Full term. No medications. NKDA. IUTD.
9. Skill Training

Act 1: Compensated Hypovolemic Shock (Tech): 2-4 minutes

<table>
<thead>
<tr>
<th>HR</th>
<th>192</th>
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<tbody>
<tr>
<td>Spo2</td>
<td>97%</td>
</tr>
<tr>
<td>BP</td>
<td>82/50</td>
</tr>
<tr>
<td>RR</td>
<td>56</td>
</tr>
<tr>
<td>Temp</td>
<td>36.9</td>
</tr>
</tbody>
</table>

Pt crying intermittently. Clear breath sounds, shallow.
After 2nd failed IV attempt or 2 min → Go to Act 2

PTs

Notes:

Recognize compensated hypovolemic shock
Manage hypovolemic shock
- Oxygen
- Request IV
Core skills
- Primary Assessment (including circulatory assessment)

Exam (If asked):
- Crying softly, poor eye contact
- Mottled to elbows and knees
- Cool extremities
- Capillary refill 3-4 seconds
- No hepatosplenomegaly
- No gallop with cardiac sounds
Not able to obtain IV access
After 2nd failed IV attempt or at 2 min → Go to Act 2

Act 2: Uncompensated Hypovolemic Shock (Tech): 4-7 minutes, maximum

<table>
<thead>
<tr>
<th>HR</th>
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<tr>
<td>Spo2</td>
<td>97%</td>
</tr>
<tr>
<td>BP</td>
<td>52/22</td>
</tr>
<tr>
<td>RR</td>
<td>58</td>
</tr>
<tr>
<td>Temp</td>
<td>37.5</td>
</tr>
</tbody>
</table>

PTs

Notes:

Manage hypovolemic shock
- 100% oxygen
- IO access
- Isotonic Crystalloid Bolus #1
- Isotonic Crystalloid Bolus #2
Core skills
- IO placement
- Reassess after boluses

Exam (If asked):
- Patient no longer crying
- Mottled to elbows and knees
- Capillary refill 5 sec unresponsive to pain

Responses:
- If call out correct landmarks, IO obtained.
- If give 1st bolus: HR 190, RR 44, BP 62/38
- If give 2nd bolus: HR 180, RR 36, BP 74/45
- If request bedside glucose: 62
- If request cbg: 7.21/28/44/39/-15
- If finish 2nd bolus or reach maximum time → Go to Act 3

PTs

Notes:
9. Skill Training

Act 3: Resolution (Tech): 7-9 minutes

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<tr>
<th>HR</th>
<th>176</th>
</tr>
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<tbody>
<tr>
<td>Spo2</td>
<td>98%</td>
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<tr>
<td>BP</td>
<td>80/45</td>
</tr>
<tr>
<td>RR</td>
<td>28</td>
</tr>
<tr>
<td>Temp</td>
<td>37.5</td>
</tr>
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Technologist Information | Teaching Objectives | Instructor Information
---|---|---
All vital signs normalizing cries | Reassess | Exam (If asked):
After 2 min → end scenario | Plan disposition | Mottled hands and feet
 | | CR 3-4 sec
 | | Opening eyes, cries occasionally

Responses:
- After 2 min → end scenario

Notes:

Debriefing the Team

Medical Management Learning Objectives

<table>
<thead>
<tr>
<th>Recognizing Hypovolemic Shock</th>
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<tbody>
<tr>
<td><strong>Debriefer Script</strong></td>
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<tr>
<td>• I (did/didn't) hear you call out physical exam findings of (e.g. tachycardia, hypotension, weak pulses, delayed capillary refill, altered mental status). A primary survey (was great for helping/could have helped) the team recognize hypovolemic shock. What did you notice in the patient's physical exam?</td>
</tr>
<tr>
<td>• I (did/didn't) hear you call out whether the patient was in (compensated/uncompensated) shock. Recognizing this distinction and stating it out loud can be critical to getting the team on the same page and coordinating care. What signs/symptoms (did/could have) helped?</td>
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## 9. Skill Training

### Manage Hypovolemic Shock

<table>
<thead>
<tr>
<th>Debrief Script</th>
<th>Reference Material</th>
<th>Instructor Notes</th>
</tr>
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<tbody>
<tr>
<td>• I noticed you treated this patient’s shock with (x). I think this was (great/ could have been better), since it’s important for hypovolemic shock to start oxygen and give IV/IO isotonic crystalloid fluids fast. How did you decide on your treatment plan?</td>
<td>• Oxygen&lt;br&gt;  ▪ IV or IO fluids: NS or LR&lt;br&gt;  ▪ Bolus 20 ml/kg within 5-20 min&lt;br&gt;  ▪ Repeat boluses as needed to restore blood pressure and perfusion, goal 60ml/kg within 1st hour</td>
<td>Notes:</td>
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</table>

### Core Resuscitation Skills

<table>
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<tr>
<th>Debrief Script</th>
<th>Reference Material</th>
<th>Instructor Notes</th>
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<tbody>
<tr>
<td>• I noticed you (quickly/ took a while) to obtain IV/IO access. I think this is (great/could have happened faster) since rapid IV/IO fluid replacement is critical for treatment in hypovolemic shock. What (helped/hindered) your ability to achieve IV/IO access?</td>
<td>• Discuss IO indications: need vascular access, IV not available&lt;br&gt;  ▪ Discuss landmarks: proximal tibial plateau, approximately 2cm below joint, angle away from joint</td>
<td>Notes:</td>
</tr>
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</table>

### Teamwork and Communication Learning Objectives

<table>
<thead>
<tr>
<th>Debrief Script</th>
<th>Reference Material</th>
<th>Instructor Notes</th>
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</thead>
<tbody>
<tr>
<td>• I noticed your team (did/didn’t seem to) clearly identify roles. Clear roles can help a team function more effectively. What did you think of your team’s role designation?</td>
<td>• Clear leadership and team member roles&lt;br&gt;  ▪ Brief prior to patient’s arrival to create a shared mental model&lt;br&gt;  ▪ Huddle to establish shared mental model</td>
<td>Notes:</td>
</tr>
</tbody>
</table>
### 9. Skill Training

- I noticed your team **(did/didn’t) (brief/huddle)** to create a shared mental model of (team roles/working diagnosis/the treatment plan). I thought this was **(great/could have really helped)** get the team on the same page and work better together. What **(helped/hindered)** you from doing that?

- I noticed you **(using/not using) (call-out/check back)**. I think **(call-out/check back)** is critical to ensuring closed loop communication. What did you think of the communication loops? **for working diagnosis and treatment plan**
  - Use directed callout to avoid “calling orders into the air”
  - Use check back to verify orders and close the communication loop
10. Equipment Set-up

Simulation Environment preparation

Before each simulation, ensure the anticipated resuscitation equipment is available for the team’s use.

Resources

- PALS reference cards, material
- Patient Weight Estimator
- Pediatric Resuscitation Medication references (e.g.: Broselow tape, reference cards)
- Documentation forms

Universal Precautions

- Staff gowns
- Gloves
- Mask and face shields

Medications (consider having all or only a limited number of medications available)

- Adenosine
- Amiodarone
- Atropine
- Etomidate
- Fentanyl
- Ketamine
- Lidocaine
- Midazolam
- Normal Saline/Lactated Ringers
- Rocuronium
- Succinylicholine
- Epinephrine 1:10,000

Equipment

- Simulator in hospital gown, on bed
- Monitor – NIBP, HR, RR, Oxygen saturation, temperature
- Blood Pressure cuff, Heart Rate monitor leads, Oxygen saturation probe, defibillator cables
- Oxygen hook-up on wall or cylinder
- Bag-mask system, multiple size masks
- O₂ Mask, simple and/or non-rebreather
- Suction
- Thermometer
- Temperature probe
- Nasal, oral airways, multiple sizes
- Shoulder roll
- Endotracheal tubes- 3.0, 3.5, 4.0, 4.5, 5.0, cuffed or uncuffed, stylets
10. Equipment Set-up

**Equipment Cont’d**

- Laryngoscope, Miller and Mac blades, multiple sizes
- End-tidal CO2 colorimeter
- Nasogastric tube(s)
- Stethoscopes
- IV/Angiocaths, various sizes
- IO needles, 2 sizes
- Gauze, Tape
- IV tubing
- IV pumps, pressure bags
- 3 way stopcocks
- Syringes, multiple sizes
- Bedside blood sample processors: glucose, lytes, gases
- Specimen tubes
- Crash cart & backboard
- Defibrillator
## 11. Assessment Methods

Type(s) of Assessment Methods Used in This Training:

- [ ] Pre-test Only
- [x] Pre-test & Post-test
- [ ] Post-test Only

- [x] Medical Management Evaluation/Debriefing Form *(Appendix E)*
- [x] Teamwork and Communication Evaluation/Debriefing Form *(Appendix F)*
- [x] Simulation Session Evaluation *(Appendix G)*
## 7. Appendices

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<td>Appendix F</td>
<td>Pediatric Hypovolemic Shock Teamwork and Communication Evaluation/Debriefing Form</td>
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<td>Appendix G</td>
<td>Pediatric Hypovolemic Shock Simulation Session Evaluation Form</td>
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Appendix A: Scenario Algorithm

**SCENARIO TIMELINE**

**Prelude:**
- **Timer:** 0-2 min
- Triggers: initial history provided outside the simulated patient care area.
- End: 2 min into scenario

**Act 1: Compensated Hypovolemic Shock**
- **Timer:** 2-4 min
- Triggers: Start 2 min into scenario.
- End: After 2nd IV attempt or at 4 min into scenario.

**Act 2: Uncompensated Hypovolemic Shock**
- **Timer:** 4-7 min
- Triggers: Start 4 min into scenario.
- End: After 2nd fluid bolus or 7 min into scenario.

**Act 3: Resolution**
- **Timer:** 7-9 min
- Triggers: Start after 2nd fluid bolus or 7 min into scenario.
- End: 9 min into scenario.

**VITAL SIGNS**

- **Act 1:**
  - Rhythm: sinus tachycardia
  - HR: 112 bpm
  - BP: 182/90
  - SAT: 97%
  - RR: 99/min
  - Temp: 36.9°C

- **Act 2:**
  - Rhythm: sinus tachycardia
  - HR: 202 bpm
  - BP: 182/22
  - SAT: 97%
  - RR: 99/min
  - Temp: 37.5°C

- **Act 3:**
  - Rhythm: sinus tachycardia
  - HR: 176 bpm
  - BP: 80/45
  - SAT: 98%
  - RR: 29/min
  - Temp: 37.5°C

**FACILITATOR INFORMATION**

- Allow team to brief outside the simulated patient care area
- If requested, additional history available.
- Exam available if requested.

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Hypovolemic Shock
Appendix B: TeamSTEPPS References

Teamwork and Communication (TeamSTEPPS) Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Adaptability</td>
<td>The ability to adjust strategies and altering a curriculum of action in response to changing conditions (internal and external).</td>
</tr>
<tr>
<td>Brief</td>
<td>Discussion prior to start that assigns essential roles, establishes expectation, anticipated outcomes and likely contingencies.</td>
</tr>
<tr>
<td>Call-Out</td>
<td>A tactic used to communicate critical information during an emergent event. Helps the team prepare for vital next steps in patient care. (Example: “Airway status?” – “Airway clear”; “Breath sounds?” – “Breath sounds decreased on right”)</td>
</tr>
<tr>
<td>Check-Back</td>
<td>A communication strategy that requires a verification of information. The sender initiates the message; the receiver accepts it and restates the message. In return, the sender verifies that the re-statement of the original message is correct or amends if not. (Example: “Give Benadryl 25 mg IV push” – “Benadryl 25 mg IV push” – “That’s correct”)</td>
</tr>
<tr>
<td>CUS</td>
<td>Signal phrases that denote “I am Concerned, I am Uncomfortable, This is a Safety Issue.” When spoken, all team members will understand clearly not only the issue but the magnitude of the issue.</td>
</tr>
<tr>
<td>Debrief</td>
<td>Brief, informal information exchange session designed to improve team performance and effectiveness.</td>
</tr>
<tr>
<td>DESC Script</td>
<td>A technique for managing and resolving conflict. Describe the specific situation or behavior; provide concrete data. Express how the situation makes you feel/what your concerns are. Suggest other alternatives and seek agreement. Consequences should be stated in terms of impact on established team goals; strive for consensus.</td>
</tr>
<tr>
<td>Huddle</td>
<td>Ad hoc planning to re-establish Situation Awareness; designed to reinforce plans already in place and assess the need to adjust the plan.</td>
</tr>
<tr>
<td>SBAR</td>
<td>A framework for team members to structure information when communicating to one another. S = Situation (What is going on with the patient?) B = Background (What is the clinical background or context?) A = Assessment (What do I think the problem is?) R = Recommendation (What would I do to correct it?)</td>
</tr>
<tr>
<td>Shared Mental Model</td>
<td>An organizing knowledge structure of relevant facts and relationships about a task or situation that are commonly held by team members</td>
</tr>
<tr>
<td>Situation Awareness</td>
<td>The ability to identify, process, and comprehend the critical elements of information about what is happening to the team with regards to the mission. It’s knowing “What is going around you” and “What is likely to happen next”.</td>
</tr>
<tr>
<td>Situation Monitoring</td>
<td>The process of actively scanning and assessing elements of the situation to gain information or maintain an accurate awareness or understanding of the situation in which the team functions.</td>
</tr>
<tr>
<td>Two-Challenge Rule</td>
<td>Assertively voicing concern at least two times to ensure it has been heard.</td>
</tr>
</tbody>
</table>
Appendix C: Debriefing Overview

*Simulation creates the opportunity to debrief.*

We believe that the focus of each simulation should be the DEBRIEF. *Simulation creates the opportunity to examine our medical management, technical skills and teamwork and communication skills.* It facilitates discussion about challenges in a safe environment in order to improve the quality of patient care.

**Framework for debriefing:**

Each debrief should consist of 3 components:

- Introduction
- Discussion of medical management and technical skills
- Discussion of teamwork and communication skills

1) Introduction

This “sets the stage” for debriefing and creates expectations.

What you might say:
- This is an opportunity to reflect and learn, improve our medical care, team work, and communication.
- Everyone should be able to ask questions and share their thoughts.
- Once you leave this session, we encourage open discussion of the concepts, but ask you to not to discuss individual performance.

2) Medical management and technical skills

This portion of the discussion focuses on the medical aspects of the case. It’s usually more comfortable to begin with these “facts”.

What you might say:
- Let’s begin by discussing medical management.
- What did you think was wrong with the patient? Can someone summarize in 3 sentences what happened in this scenario?
- What led you to think that?

3) Teamwork and communication (a. k. a. crew resource management, non-technical skills, human factors)

This portion of the discussion focuses on how the team worked together. It can be emotionally charged and difficult to discuss without feeling personal. The challenge is to try to generalize specifics into themes.

What you might say:
- Let’s talk about how you functioned as a team.
- What did your team do well?
- What could your team do differently next time?
- That is something I see often. Has anyone else experienced that? What have you seen done?
Appendix C: Debriefing Overview

4) Summarizing

- *This is your opportunity to ensure the key learning points are highlighted*
- *Try to identify approximately three take-home medical/technical points and teamwork/communication points.*
- *You may ask the participants’ to identify take home points or call them out yourself.*

*Medical management/technical skills examples:*
(a) This was a case of pediatric hypovolemic shock.
(b) Signs of uncompensated hypovolemic shock: hypotension, inadequate end organ perfusion, tachycardia, tachypnea, altered mental status.
(c) Treatment of hypovolemic shock: isotonic crystalloids 20 mL/kg bolus over 5-20 minutes

*Teamwork/communication examples:*
(d) Recognize need for a full resuscitation team when a patient develops uncompensated hypovolemic shock.
(e) Designate leadership and team member roles to ensure coordinated team functioning.
(f) Use *brief* or *huddle* to create a shared mental model for the working diagnosis and treatment plan.

General Facilitator Goals:
- Try to facilitate the TEAM’s discussion (avoid dominating the conversation)
- Ask open ended questions (avoid yes/no questions)
- Discuss the team performance (not the individual)
- Consider having the team “re-run” the scenario after the debrief to implement their learning points. If you do this, you will need to decrease the time of the first debrief to allow for a short “re-run” of the scenario and a short debrief of the second scenario.
Appendix D: Learner Handouts

Hypovolemic Shock Learning Objectives

1. Recognize Hypovolemic Shock
   a. History suggestive of fluid losses or fluid shifts
   b. Quiet tachypnea
   c. Tachycardia
   d. Normal blood pressure to hypotension
   e. Weak or absent peripheral pulses
   f. Normal or weak central pulses
   g. Delayed capillary refill
   h. Cool to cold, pale, diaphoretic skin
   i. Changes in mental status
   j. Oliguria

2. Distinguish Compensated vs Uncompensated Shock
   a. Uncompensated shock represents severely compromised end-organ perfusion
   b. End-organ perfusion impairment
      i. Hypotension
      ii. Altered mental status – Brain perfusion
      iii. Capillary refill, skin color / temp --Skin perfusion
      iv. Oliguria or anuria – renal perfusion

3. Manage Hypovolemic Shock
   Shock is a state of inadequate perfusion to meet metabolic demands. Management priorities are:
   a. Position -- If unstable – place in Trendelenburg
   b. 100% supplemental Oxygen (face mask – simple or non-rebreather)
   c. Rapid vascular access
   d. Fluid resuscitation
      i. Types of fluid
         • Normal Saline (NS)
         • Lactated Ringer’s (LR)
      ii. How much?
         • Start with 20 cc/kg bolus and Reassess
         • Repeat as much as necessary
         • Patients in hypovolemic shock often need a minimum of 60 cc/kg to reverse the shock and may need more than 100 cc/kg
         • If you are concerned about cardiac problems, can start with 10 cc/kg and reassess
      iii. How fast? – as fast as it will go,
         **Goal is 60 cc/kg in 60 min or less**
         • IV push with 60 or 30 mL syringes
         • Pressure bag
      e. Monitoring
         i. Pulse oximetry
         ii. Capnography, if available
         iii. Heart rate
         iv. Blood pressure
         v. Mental status
         vi. Temperature
         vii. Urine output
      f. Frequent reassessment
         i. Evaluate trends in the child’s condition
         ii. Determine response to therapy
         iii. Plan next treatment interventions
g. Ancillary studies
   i. Help to work through differential
   ii. Evaluate organ dysfunction
   iii. Identify metabolic abnormalities
   iv. Evaluate response to treatment
      • Bedside glucose
      • Electrolytes – esp K+ and ionized calcium
      • Blood gas
      • Lactate (potentially)
      • CBC

4. Core Resuscitation Skills
   a. Assessing circulatory status – complete assessment of circulation requires all of the following
      i. Skin color and temperature
      ii. Heart rate
      iii. Heart rhythm
      iv. Blood pressure
      v. Pulses
      vi. Capillary refill time
   b. Demonstrate IO placement
      i. Where to place them
         • Proximal tibia (Most common)
            ◦ Medial aspect of proximal tibia, 1 to 2 cm below and avoiding the tibial tuberosity
         • Distal Femur
            ◦ 1 to 2 cm proximal to superior border of patella and slightly medical or lateral to anterior ridge
         • Distal Tibia
            ◦ 1 to 2 cm proximal to medial malleolus in the center of the bone
      ii. How to place them
         • Prep the area
         • Grasp IO needle in dominant hand and place it on the insertion site with point angled slightly away from the joint space
            ◦ Don’t rest the limb in your nondominant hand, as the needle may penetrate both cortices and stick you!!
         • Use firm downward pressure and rotate the needle back and forth (slight twisting) until you feel the “pop” through the cortex.
            ◦ The needle should stand on its own
         • Remove the stylet.
         • Confirm placement.
            ◦ Aspirate the marrow. Blood and marrow confirms the placement, but is often not obtained.
            ◦ Infuse fluids and look for extravasation
         • Secure the IO.
      iii. Contraindications
         • Ipsilateral fracture – fluids/meds can extravasate
         • Infection – can introduce bacteria, resulting in osteomyelitis or other deep infection
         • Compartment syndrome
Appendix E: Medical Management Evaluation/Debriefing Form

Pediatric Hypovolemic Shock
Medical Management/Technical Skills

This checklist identifies core medical management /technical skills. It’s hard to discuss more than 3 of these during one debriefing session. We recommend selecting 2-3 of these issues to focus on.

Assessment of ABCDE’s

[ ] Done Well  [ ] Needs Work

Specific comments: __________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

What did you think of the assessment of the ABCDE’s? What could you do differently?

Recognizing hypovolemic shock

[ ] Done Well  [ ] Needs Work

Specific comments: __________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Discuss Points: What are the signs of hypovolemic shock? - tachycardia, hypotension, weak pulses, delayed capillary refill, altered mental status

Managing hypovolemic shock

[ ] Done Well  [ ] Needs Work

Specific comments: __________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Discuss Points: What’s the treatment for hypovolemic shock? Supplemental oxygen, rapid administration of IV/IO isotonic crystalloids 20 mL/KG bolus over 5-20 min repeated until blood pressure and perfusion are restored

Obtaining IV/IO access

[ ] Done Well  [ ] Needs Work

Specific comments: __________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Can you describe placement of an IO line? Tibial plateau, 2 cm below the joint line, angled away from the joint
### Appendix F: Teamwork and Communication Evaluation/Debriefing Form

#### Pediatric Hypovolemic Shock

**Teamwork and Communication Evaluation**

This checklist identifies core teamwork and communication skills. It’s hard to discuss more than 3 of these during one debriefing session. We recommend selecting 2-4 of these issues to focus on.

<table>
<thead>
<tr>
<th><strong>Leader/Roles Identified &amp; Maintained</strong></th>
<th>□ Done Well □ Needs Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific comments:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Discussion Points: What helped/hindered having clear leadership and roles? (Did team leader use verbal/visual cues to establish leadership? Did team leader say all orders, priorities? Did team members direct questions/info to team leader?)*

<table>
<thead>
<tr>
<th><strong>Directed Call out</strong></th>
<th>□ Done Well □ Needs Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific comments:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Discussion Points: How were orders given- “Into the air” or directed at specific individuals? What did that impact you? How could they be delivered more effectively?*

<table>
<thead>
<tr>
<th><strong>Check back/Closed loop communication</strong></th>
<th>□ Done Well □ Needs Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific comments:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Discussion Points: describe closed loop communication*

<table>
<thead>
<tr>
<th><strong>Shared Mental Model</strong></th>
<th>□ Done Well □ Needs Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific comments:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Discussion Points: How did team members share information/working diagnosis/treatment plan (brief/huddle?)*
## Simulation Session Evaluation Form

**Facilitator:** ______________________________  **Date:** ______________

**Case Presented:** ______________________________

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This simulation case provided is relevant to my work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. The simulation case was realistic.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. This simulation case was effective in teaching basic resuscitation skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. This simulation case was effective in teaching hypovolemic shock management skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. The debrief created a safe environment.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. The debrief promoted reflection and team discussion.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Can you list/describe 1 or more ways this simulation session will change how you do your job?

**Comments:**
Appendix H: References


